

REMARKS

Prior to this Amendment, claims 1-58 were pending in the application.

Claims 41-58 were previously withdrawn from prosecution in response to a restriction requirement and are cancelled with this Amendment to hasten allowance of the other pending claims.

Claim 1 is amended to clarify that the method includes illuminating a first surface of a wafer . . . and wherein a second surface of the wafer opposite the first surface is positioned on a reflective support or coated with a reflective material. Original dependent claims 35 and 36 are cancelled, with their limitations being added to claim 1.

New claims 59-66 are added. No new matter is added with support found at least in the originally filed claims and Figures 3-7.

After entry of the Amendment, claims 1-34, 37-40, and 59-66 remain for consideration by the Examiner.

Claim Rejections Under 35 U.S.C. §102

In the Office Action mailed October 29, 2008, claims 1-40 were rejected under 35 U.S.C. §102(b) as being unpatentable over U.S. Pat. No. 4,625,114 ("Bosacchi"). This rejection is traversed based on the following remarks.

The claims are generally directed toward methods that include illuminating a first surface of a wafer with radiation and positioning the second surface on a reflective support or coating it with reflective material. The methods also include receiving a signal with information germane to total reflectance of the radiation from the wafer. The information of the signal is compared to information in a database to determine characteristics of the wafer including thickness and surface roughness or the like.

Bosacchi does not teach illuminating a surface of a wafer and then determining total reflectance of the radiation/light that is directly incident on the wafer as a manner of determining thickness and surface characteristics of the wafer. Further, Bosacchi does not disclose the use of a reflective support or a reflective coating on the second surface of the wafer. As explained at least with reference to Figures 5 and 6 in Applicant's specification, use of such a reflective support or coating "extends the range or bounds of total reflectance" in a region of wavelengths where moderate absorption of

the radiation occurs. The Applicant determined that it would be useful to extend this region (Region II in his specification) because in regions of high or low absorption there is less difference between wafers of differing thickness, which makes determination of wafer thickness when considering the signals from the wafers in these regions. For example, in Figure 6, there is basically no difference in the total reflectance of two wafers in a first region of higher absorption (and less total reflectivity) whereas in a second region of moderate absorption there is a larger differential. This makes it easier to determine thickness and other characteristics by comparing information such as total reflectivity in this second region of moderate absorption, and the use of a reflective platform or a reflective coating extends this region of moderate absorption.

The Office Action cites Bosacchi at col. 8, lines 3-60, col. 12, line 65 to col. 13, line 8, col. 9, lines 45-65, and col., 12, lines 30-65, and photodetector 50 in Figure 4 as showing all the recitations of claim 1. Also, these same citations were cited as showing the recitations of dependent claims 2-40, but no specific citation was provided for each additional recitation of all of these dependent claims.

Regarding claim 1, Bosacchi fails to show use of a reflective support or coating of reflective material on the second surface (e.g., the surface opposite the one upon which light/radiation is directly incident upon). Instead, Figure 4 shows that a multilayer thin film wafer 25 is positioned between a surface 36 of support member 35 and a block 45. There is no discussion in the specification when describing Figure 4 that the wafer 25 is coated with a reflective material opposite the coupler 37 (which abuts the first or upper surface of the wafer 25), and there is no teaching or suggestion that it would be useful to have the block 45 be a reflective support. Hence, Bosacchi cannot anticipate each recitation of claim 1. In addition, Bosacchi provides no suggestion of the desirability of extending the moderate absorption region for use in analyzing wafers' thicknesses and characteristics based on total reflectance (or even a mention of the possible importance of such as region of absorption). Since the use of a reflective support or coating of reflective material limitation is not shown or suggested, claim 1 is believed allowable over the teaching of Bossachi.

Further, Bossachi does not merely call for illuminating a first surface of a wafer with radiation and then obtaining a signal based on "total reflectance" of the radiation as

called for in claim 1. Instead, Bossachi teaches in the cited col. 8 and elsewhere use of the “principles of frustrated total reflectance.” To this end and with reference to Figures 1-3, Bossachi discusses use of collimated light from a laser, abutting a specially designed coupler to the upper surface of the wafer, and significance of an air gap, which are not called for or needed in the method of claim 1. For this additional reason, claim 1 is not shown by Bossachi. Applicant also notes that Bossachi differs from the methods taught by Applicant as it uses frustrated total reflectance (in contrast to radiation transmitted directly onto a wafer surface) and a coupler (rather than a source providing radiation directly incident on the wafer surface), while also teaching that total internal reflectance couples light to the test wafer, only a very small area measurement where laser strikes surface, and reflectance is measured as a function of angle.

Claims 2-34 and 37-40 depend from claim 1 and are believed allowable over Bossachi at least for the reasons provided for allowing claim 1 over this reference. Further, claims 11 and 13 specifically call for the signal to be acquired with non-contact techniques whereas Bossachi teaches that a coupler is generally placed in contact with the wafer but some airgaps will occur with a wafer having a surface roughness. Claim 18 calls for the signal to be acquired using a Sopori reflectometer while claim 19 calls for use of a PV reflectometer. Bossachi does not teach use of either of these devices, and the Office Action does not provide a particular citation to Bossachi for these limitations. Claim 26 calls for “selecting a total reflectance value and correlating the selected value to a wavelength” (e.g., see Applicant’s Figure 6), and Bossachi fails to discuss such steps in its data analysis. Claim 27 further calls for the wavelength to be within a range of wavelengths (e.g., associated with the moderate absorption range or multiple internal reflections as called for in claim 28). For these additional reasons, Bossachi does not anticipate claims 11, 13, 19, and 26-28.

New claims 59-66 are added to provide additional protection for Applicant’s invention, and Bossachi fails to show at least one of the numerous additional recitations in independent claims 59 and 64.

Conclusions

In view of all of the above, it is requested that a timely Notice of Allowance be issued in this case.

No fee is believed due with this submittal. However, any fee deficiency associated with this submittal may be charged to Deposit Account No. 14-0460.

Respectfully submitted,



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